Biodegradable Packaging from chitinolytic fish wastes: the FISH4FISH project

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NEXT TECHNOLOGY TECNOTESSILE
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EMFF OPERATIONAL PROGRAMME 2014-2020

European Union
European Maritime and Fisheries Fund

Plastic pollution

- The global production of synthetic plastics, which are carbon-based polymers such as polypropylene, polyethylene, polyvinyl chloride, polystyrene, nylon, and polycarbonate, has continuously increased.
- Approximately 360 million tons of plastics were produced in 2018
- Conventional plastic play a pivotal role in modern society

The «Shell Biorefinery» concept

- N. Yan &X. Chen, *Nature* (2015) 524,155-157

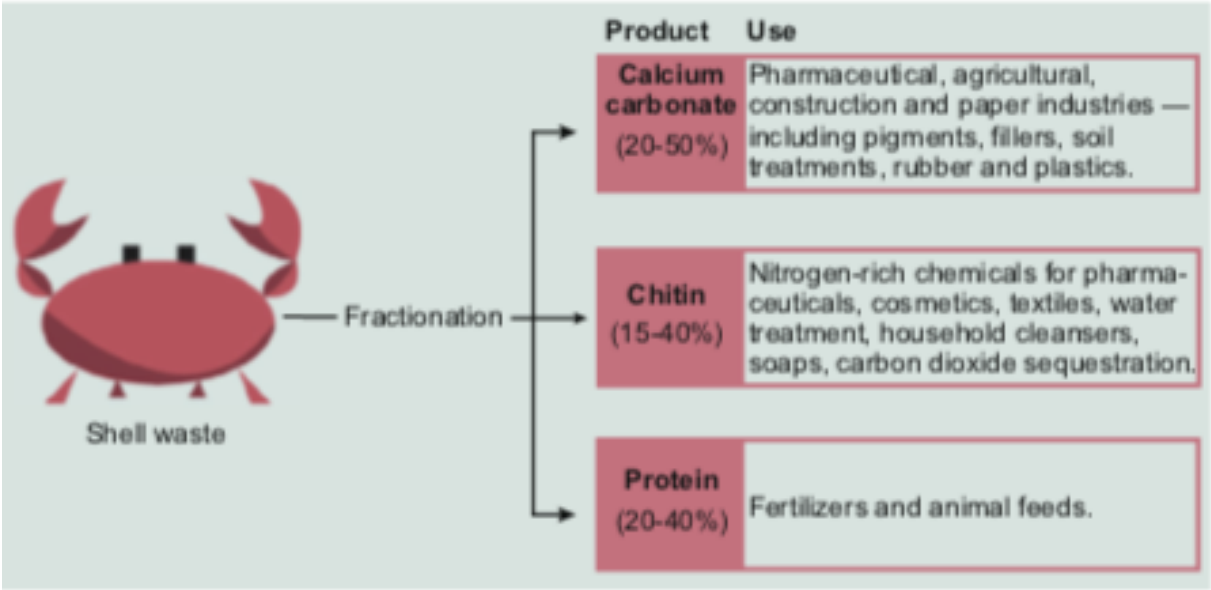
Crustacean shells production:

6 to 8 million tons each year of waste crab, shrimp and lobster
shells are produced globally in the food processing industry

Shrimp production (2016)
Wild catches = 37%
Farming shrimp = 57%

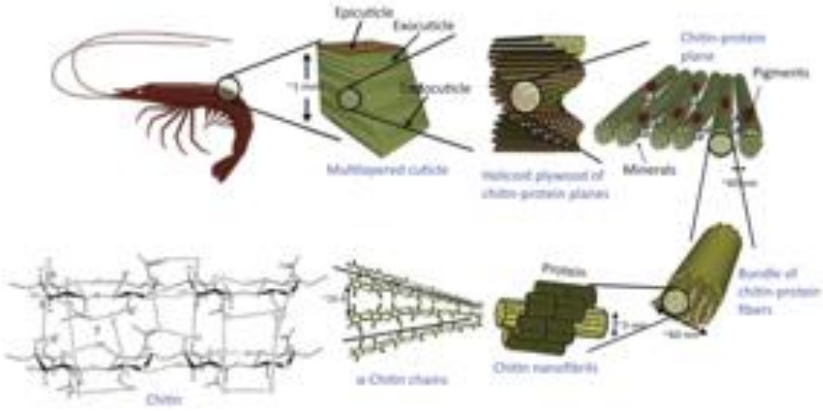
In a crab mass meat accounts only for 40%

The «Shell Biorefinery» concept



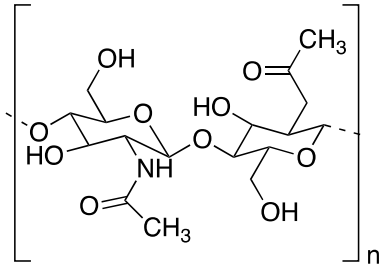
«Biorefinery» = the conversion of raw materials into a product with a higher value

- Astaxanthin (high value pigment)
- 1-2% extractable fats with a high content of unsaturated fatty acids



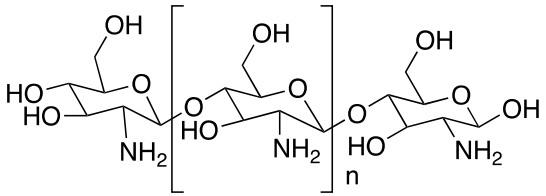
- M.J. Hülsey, Green *Energy & Environment* (2018) 3, 318-327

The «Shell Biorefinery» concept

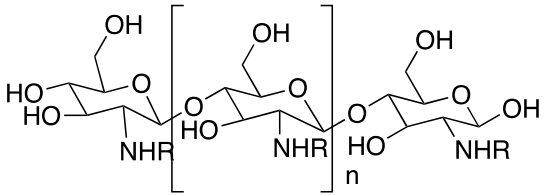


N-acetylglucosamine chain

Chitin

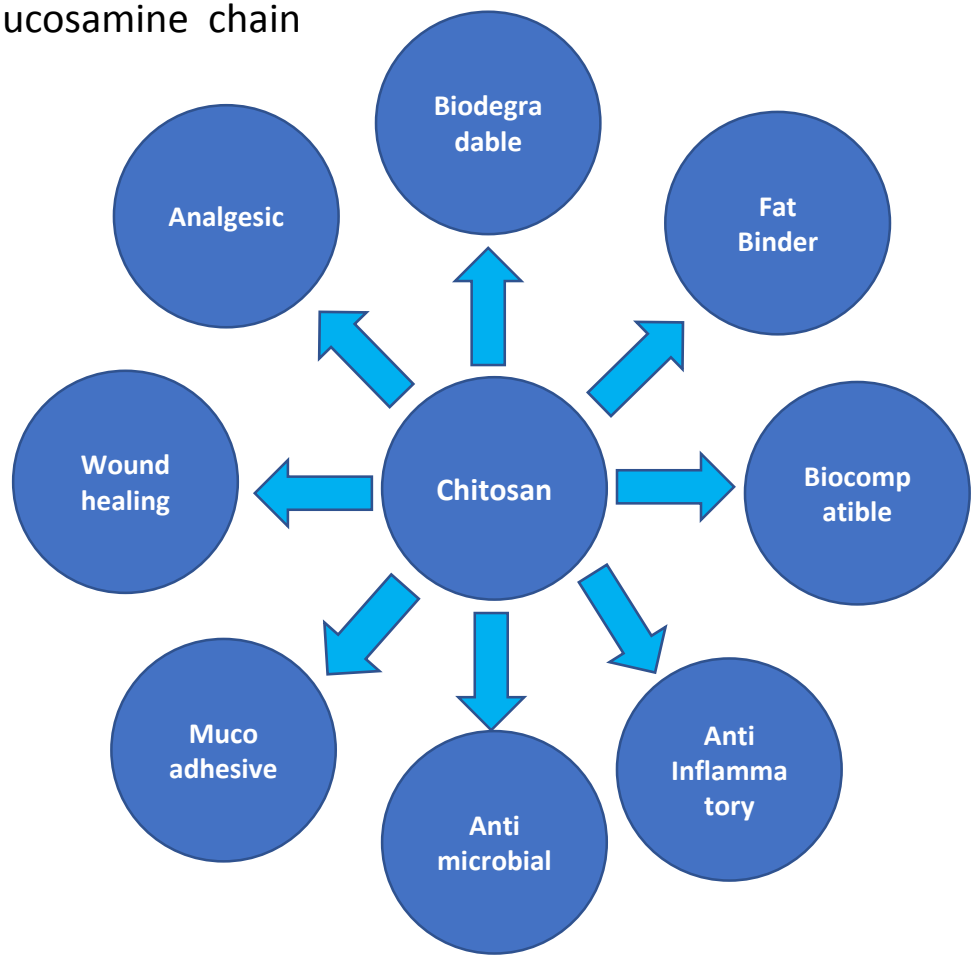


Chitosan



R= H or Ac n= 0 to 8

Chitooligosaccharide

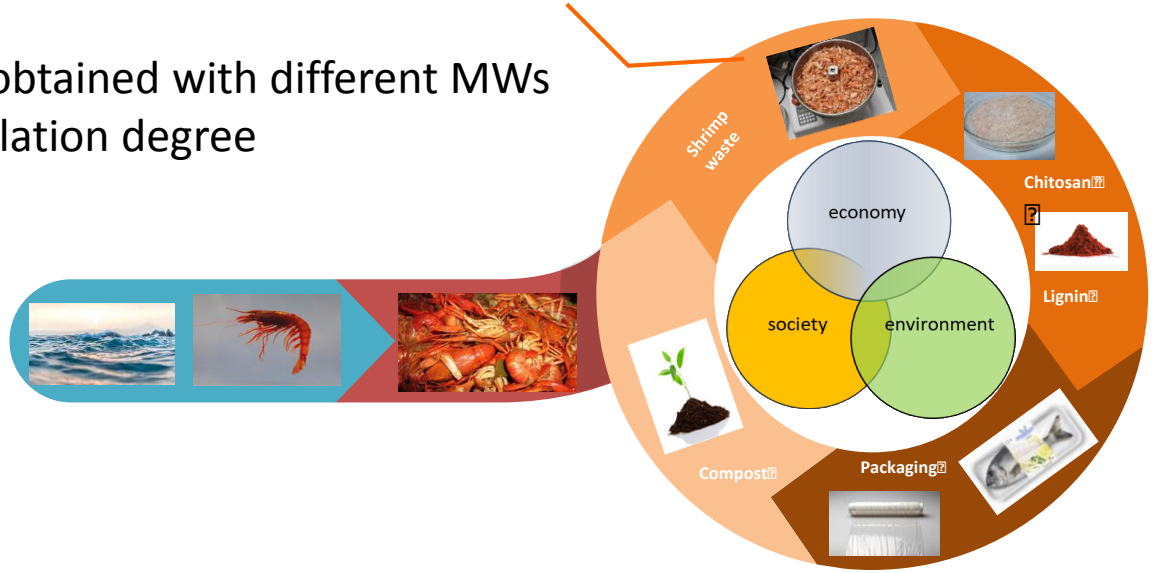


Project target

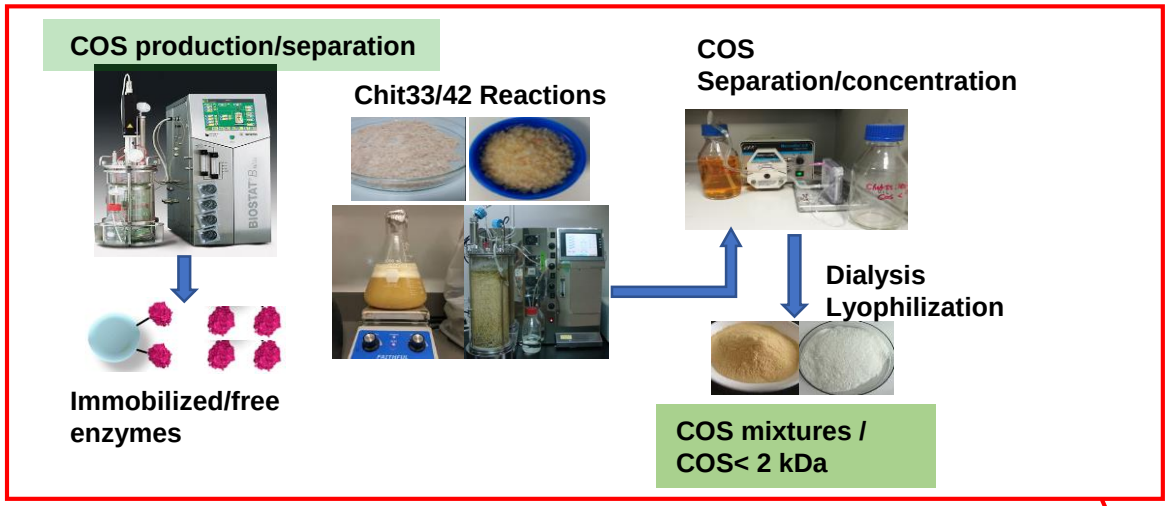
- ✓ Active packaging biocomposite to reduce microbial spoilage to enhance fish shelf-life
- ✓ High perfomance packaging (mechanical, thermal and barrier properties, increase the shelf life of fish)
- ✓ Biodegradable and compostable to be used as fertilizer and microbial preservative for plants

The FISH4FISH project in a nutshell

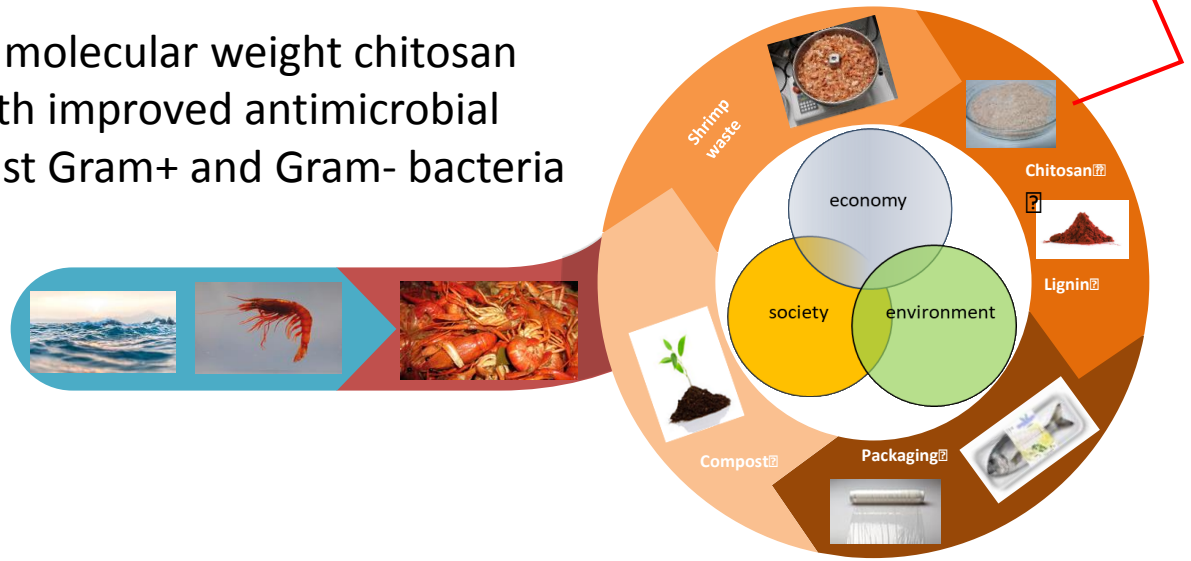
➢ Chitosan obtained with different MWs and de-acetylation degree



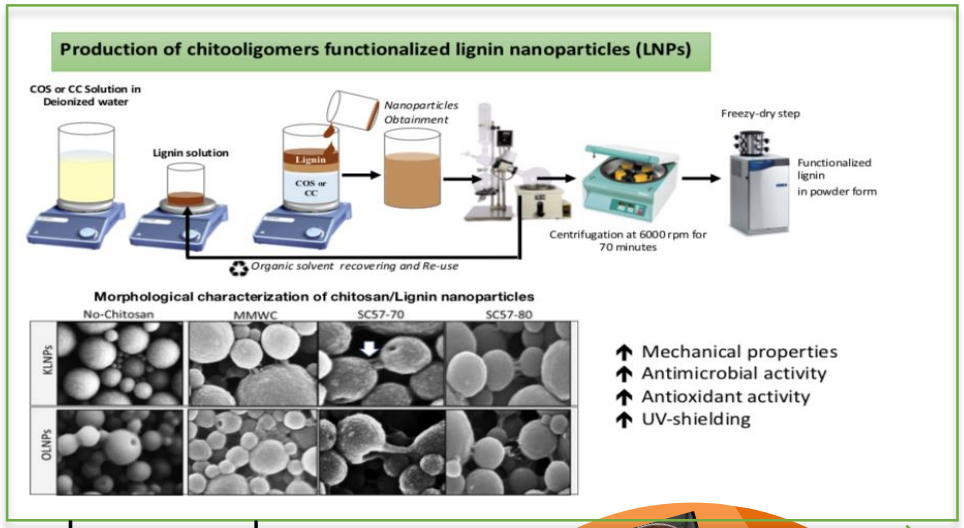
The FISH4FISH project in a nutshell



- COS - low molecular weight chitosan oligomers with improved antimicrobial activity against Gram+ and Gram- bacteria and fungi

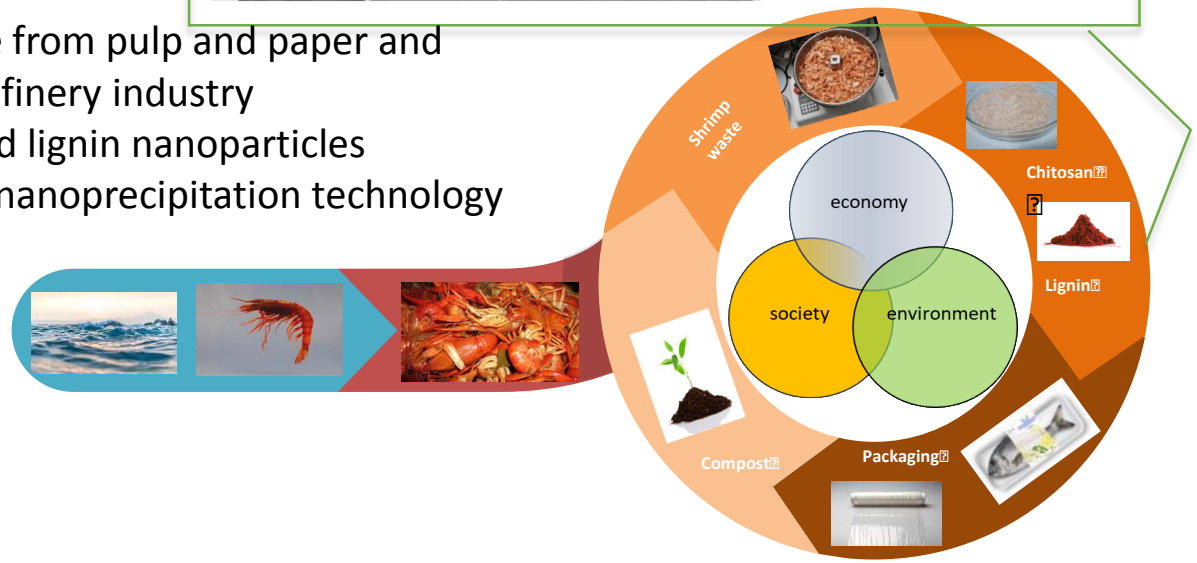


The FISH4FISH project in a nutshell

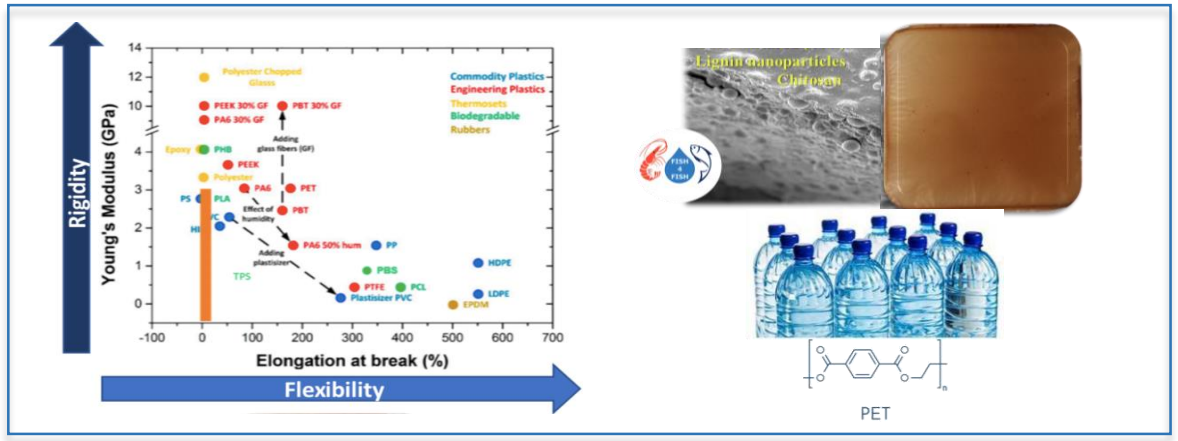


- Lignin - waste from pulp and paper and bio-refinery industry
- Functionalized lignin nanoparticles

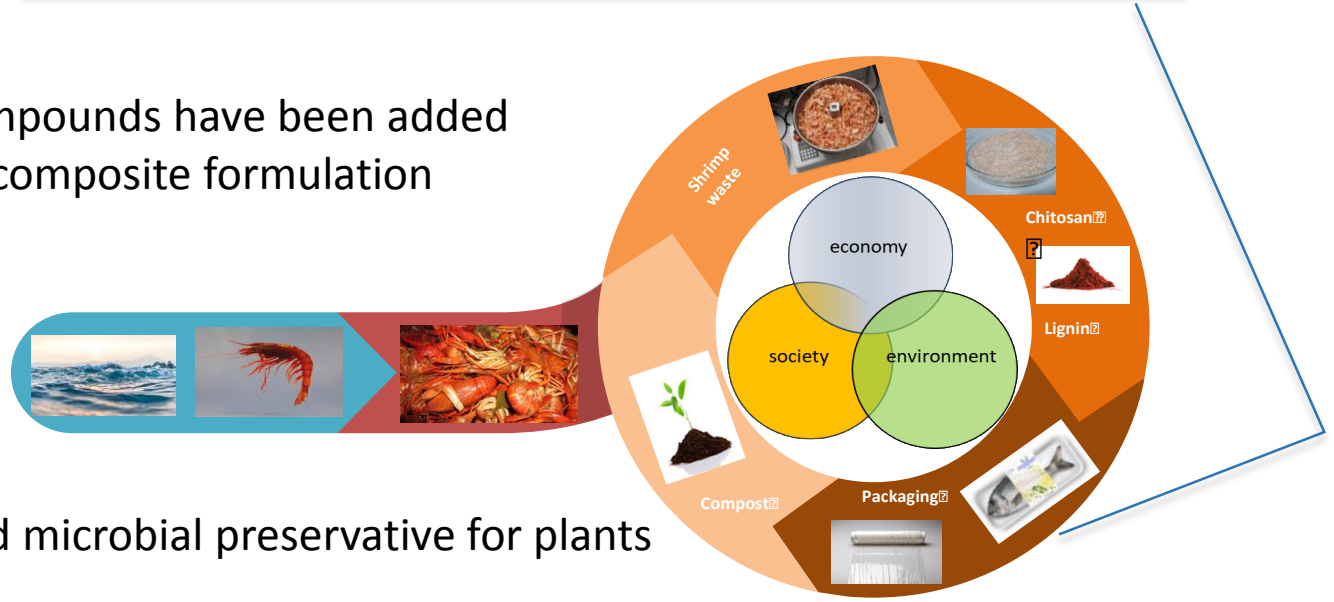
prepared by the nanoprecipitation technology



The FISH4FISH project in a nutshell



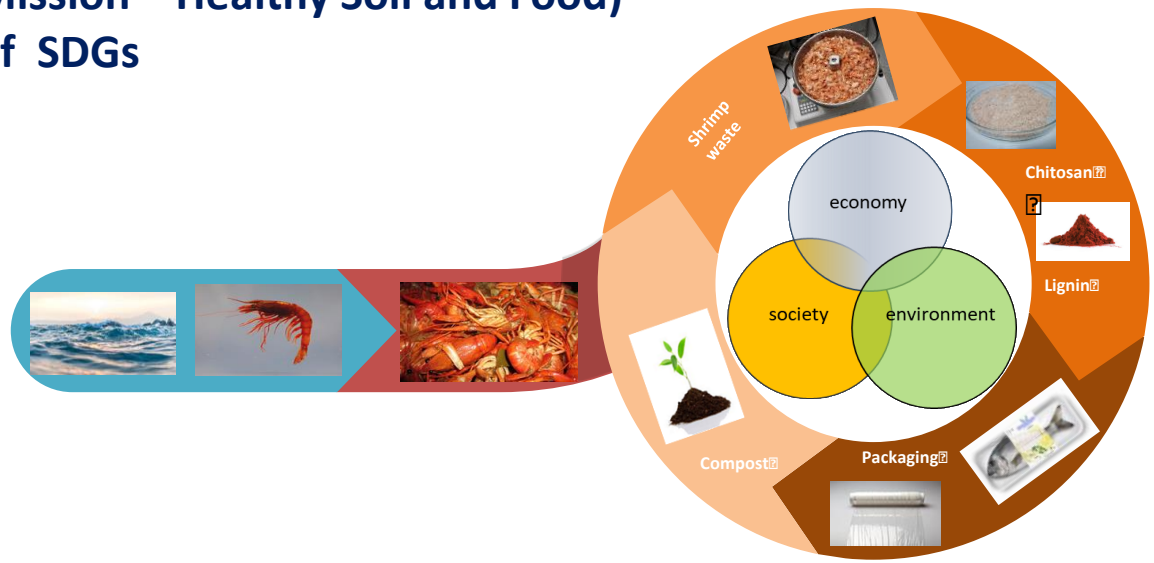
- No toxic compounds have been added to the final biocomposite formulation



- Fertilizer and microbial preservative for plants

The FISH4FISH project in a nutshell

- Reduction of plastic pollution from coasts and seas, preservation of marine environment (2018 blue economy report, Horizon Europe Mission – Healthy Ocean)
- New value to the fish industry waste
- Enhance competitiveness of fish-processing industry
- Reduction of food waste
- Contribution to soil health for a high quality compost (Horizon Europe Mission – Healthy Soil and Food)
- Implementation of SDGs



Acknowledgements

FISH4FISH PARTNERS

Tecn packaging

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CSIC

NEXT TECHNOLOGY

UNIVERSITÀ DI SIENA 1240

Project Coordinator

Fishery wastes

Chitin

Chitosan

Lignin nanoparticles
Or functionalized lignin nanoparticles

Home Compostable plastics for Fish packaging

Antioxidant
Photoprotective
Antimicrobic

http://fish4fish.dbcf.unisi.it

Fish4Fish Project EU-Emff- Blue Economy

@Fish4fishP

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Project video:

https://www.youtube.com/watch?v=flXrUEz0yRw

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THANK YOU FOR YOUR ATTENTION

FISH4FISH

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